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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/725,165	RAMOS ET AL.	
	Examiner	Art Unit	
	Jennifer A. Leung	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 August 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Jennifer A. Leung

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 21, 2007 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Owen et al. (US 3,821,103) in view of Jones (US 2,634,191), Stine et al. (US 3,231,326) and Zenz (*Fluidization, Solids Handling and Procession.* Chapter 12: Cyclone Design. pp. 812-815).

Regarding claim 1, Owen et al. (FIG. 1; column 3, line 65 to column 4, line 30; column 5, lines 19-35) discloses an apparatus comprising a primary cyclone **65** and a secondary cyclone **67**, wherein a cyclone separator leg joins the lower end of the leg **69** of the secondary cyclone **67** and the leg **71** of the primary cyclone **65** to form a single primary and secondary cyclone leg complex where solids collected by both cyclones are combined (see FIG. 1), the termination of the cyclone separator leg being immersed in a fluidized bed of particles **73**.

Owen et al. is silent as to the cyclone separator leg terminating distally in a radius-curved single leg termination that is devoid of movable sealing parts. Although not specifically described by Owen et al., it appears from the illustration of FIG. 1 that the cyclone separator leg does, however, terminate distally with *some* sort of dip-leg sealing arrangement. The Examiner takes Official Notice that such illustration is commonly used in the art to suggest dip-leg sealing arrangements.

Jones (FIG. 1) teaches a cyclone separator leg (i.e., dip-leg **16**) terminating distally in a radius curved termination (i.e., bend **20**) that is devoid of movable sealing parts (i.e., During normal operation, the dip-leg **16** is open at its lower end and thus devoid of movable sealing parts. The seals taught by Jones are only present during the loading of the vessel or start-up. *In particular*, Jones teaches a seal wherein, "the seal itself may be composed either partly or wholly of material which fill fuse or otherwise rupture or disintegrate at the desired temperature [during normal operation]." See column 2, lines 49-55; and generally, column 2, lines 24-55).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the cyclone separator leg in the apparatus of Owen et al. such that the leg terminated distally in a radius curved single leg termination that was devoid of movable sealing

parts, on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the radius curve would act as a baffle against bubbles of air rising through the catalyst bed, and the radius curve does not jam or create an undesirable restriction of the normal flow of solids of solids in the dip-legs under operating conditions as with the prior art dipleg sealing means, as taught by Jones (see column 2, lines 9-17; column 4, lines 36-39).

Owen et al. (see Figure I) further discloses that the leg **69** of the secondary cyclone **67** extends substantially straight and vertically aligned with a center axis of the secondary cyclone **67** to a junction thereof with the leg **71** of the primary cyclone **65**, the leg **71** of the primary cyclone **65** is inclined with respect to a center axis of said primary cyclone **65** to extend from said primary cyclone **65** to said junction, and said separator leg extends substantially straight and vertically aligned with the center axis of the secondary cyclone **67**, from the junction and along a portion of a length thereof. The connecting configuration of the legs **69** and **71** in Owen et al. is similar to the claimed configuration, except that configuration in Owen et al. is reversed (i.e., in Applicant's apparatus, the leg of the primary cyclone is straight and the leg of the secondary cyclone is inclined).

However, it would have been an obvious matter of design choice to a person of ordinary skill in the art at the time the invention was made to reverse the connecting configuration of the legs **69** and **71** in the modified apparatus of Owen et al., on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because Applicant has not disclosed that the connecting configuration of the primary cyclone leg to be straight and the secondary cyclone leg to be inclined (as opposed to the primary cyclone leg being inclined and the secondary cyclone leg being straight, as in Owen et al.) provides an advantage, is used for a

particular purpose, or solves a stated problem. Furthermore, one of ordinary skill in the art would have expected Applicant's invention to perform equally well with the connecting configuration of the legs being reversed, because the ability of the legs to convey particles from the primary and secondary cyclones back to the fluidized bed of particles does not appear to be affected by whether a specific cyclone leg is straight or inclined. In addition, it is noted that the claimed connecting configuration would have been considered a conventional design choice in the art, as evidenced by Stine et al. For example, Stine et al. (see Figure) teaches a cyclone separator system comprising a primary cyclone **6,17** and a secondary cyclone **9,20**, wherein the leg **8,18** of the primary cyclone extends substantially straight and vertically aligned with a center axis of the primary cyclone to a junction thereof with the leg **12,21** of the secondary cyclone, the leg **12,21** of the secondary cyclone is inclined with respect to a center axis of the secondary cyclone to extend from said secondary cyclone to said junction, and the separator leg extends substantially straight and vertically aligned with the center axis of the primary cyclone **6,17**, from the junction and along a portion of a length thereof.

Lastly, the newly added limitation of, "said fluidized bed of particles *within the cyclone legs* being located above the junction of the lower ends of the secondary and primary cyclone legs," adds no further patentable weight to the apparatus claims, because the specific level of particles within the cyclone legs will ultimately depend on the manner in which the claimed apparatus is intended to be operated. For instance, as is well known in the art of cyclone design, "[t]he extent to which the dipleg of a cyclone is filled with exiting solids depends on the pressure balance around the cyclone and it dipleg," (Zenz, page 813, under "Pressure Balance"). In addition, a claim containing a recitation with respect to the manner in which a claimed apparatus

is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also, expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim, *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969), and the inclusion of a material or article worked upon by a structure being claimed does not impart patentability to the claims. *In re Young*, 75 F.2d 966, 25 USPQ 69 (CCPA 1935); *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963).

3. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Owen et al. (US 3,821,103) in view of Jones (US 2,634,191), Stine et al. (US 3,231,326) and Zenz (*Fluidization, Solids Handling and Procession.* Chapter 12: Cyclone Design. pp 812-815), as applied to claim 1 above, and further in view of Jahnke et al. (US 4,220,623).

As shown in FIG. 1 of Owen et al., the junction of the leg **71** of the primary cyclone **65** and the leg **69** of the secondary cyclone **67** lies on the side opposite a distal end of the cyclone leg termination and higher than the distal end by a given length. Owen et al., however, is silent as to precise value of the length being shown, relative to the diameter of the leg **71** of the primary cyclone **65**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate length for the distance between the junction and the distal end, relative to the diameter of the leg **71** of the primary cyclone **65,** in the modified apparatus of Owen et al., on the basis of suitability for the intended use and absent showing any unexpected results, because the precise length would have been considered a result effective variable by one having ordinary skill in the art, as evidenced by Jahnke et al. (see

column 2, lines 6-19). Accordingly, one having ordinary skill in the art would have routinely optimized the length between the leg junction and the distal end to obtain a sufficient accumulation of catalyst in the separator leg for preventing the underflow of vapors from the cyclone separator back into the fluidized bed, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

4. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Owen et al. (US 3,821,103) in view of Jones (US 2,634,191), Stine et al. (US 3,231,326) and Zenz (*Fluidization, Solids Handling and Procession*. Chapter 12: Cyclone Design. pp 812-815), as applied to claim 1 above, and further in view of Danielsen et al. (U.S. 4,996,028).

The collective teaching of Owen et al., Jones, Stine et al. and Zenz is silent as to the instantly claimed ratio range of radius-to-diameter for the single leg termination. Danielsen et al., however, teaches, "the radius of curvature of the tubular body portion **25** preferably is in the range of from *about 1 1/2 times to about 2 1/2 times* the diameter of the tubular body portion **25**." (column 3, lines 2-10; FIG. 1-2). It would have been obvious for one of ordinary skill in the art at the time the invention was made to select a ratio of radius-to-diameter within the instantly claimed range for the single leg termination in the modified apparatus of Owen et al., on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because maintaining a pre-determined, sufficient, radius of curvature increases, under conditions of use, the stability of the dipleg solids level over that of diplegs having straight run tubular body portions, as taught by Danielson. (column 3, lines 2-10; FIG. 1-2).

5. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Owen et al. (US 3,821,103) in view of Jones (US 2,634,191), Stine et al. (US 3,231,326) and Zenz (*Fluidization, Solids Handling and Procession.* Chapter 12: Cyclone Design. pp 812-815), as applied to claim 1 above, and further in view of Luckenbach (U.S. 4,074,691) and Linden (US 2,341,671).

Regarding claim 4, the collective teaching of Owen et al., Jones, Stine et al. and Zenz is silent as to the radius curve termination of the cyclone leg (e.g., the bend **20** shown in FIG. 1 of Jones) being constructed from a succession of straight tube sections arranged in an arcuate array. In any event, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to substitute an alternate construction (e.g., one including straight tube sections) for the radius curve termination in the modified apparatus of Owen et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because the substitution of known equivalent structures involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *In re Ruff* 118 USPQ 343 (CCPA 1958). To evidence the conventionally of such curvature construction, Luckenbach (FIG. 1) teaches a cyclone comprising a dipleg **16** having a leg termination constructed of a pair of interconnected angularly disposed conduit members **12** and **14**, the upper one of which is lineal and connected with the lower vertical portion of the cyclone dipleg **16**. Similarly, Linden teaches a cyclone separator in which the production of the bent body is facilitated by making the individual sections not with curved, but with straight axes, which are inclined one to the next (see FIGs. 2, 3; page 1, column 2, line 55 to page 2, column 1, line 3).

Regarding claim 5, as modified above, the radius curve at the end of the cyclone leg in the modified apparatus of Owen et al. inherently directs the flow of descending mass of solids into a plane orthogonal to the ascending gaseous flow, by virtue of the total angle subtended by the radius curve.

Response to Arguments

6. Applicant's arguments filed August 21, 2007 have been fully considered but they are not persuasive. In summary, Applicant first argues that the combination of Owen et al. and Jones does not render the claims obvious, because the combination of Owen et al. and Jones fails to teach, (1) the level of the fluidized bed located above the junction; (2) a substantial vertical primary cyclone leg and an inclined secondary dip leg; and (3) the separator leg terminating in a radius-curved separator leg termination that is devoid of movable sealing parts.

The Examiner respectfully disagrees.

Regarding item (1), the recitations with respect to a specific level of particles within the cyclone legs (as now recited in claim 1), as well as a specific level of the fluidized bed above the junction (argued above, but not recited in claim 1 as amended), add no further patentable weight to the claims, because the specific level of the particles within the cyclone legs or the fluidized bed ultimately depends on the manner in which the claimed apparatus is intended to be operated. For instance, as is well known in the art of cyclone design, "[t]he extent to which the dipleg of a cyclone is filled with exiting solids depends on the pressure balance around the cyclone and its dipleg," (Zenz, page 813, under "Pressure Balance"). The "pressure balance", however, is a process variable and not an apparatus limitation. Also, as is well know in the art of fluidization, for a given amount of solid particulates, the level of the fluidized bed of particulates may vary

widely depending on intended use, as a function of the fluidizing gas velocity. See Regime Diagram, below (FIG. 17-4 from Perry's Chemical Engineering Handbook, 7th edition).

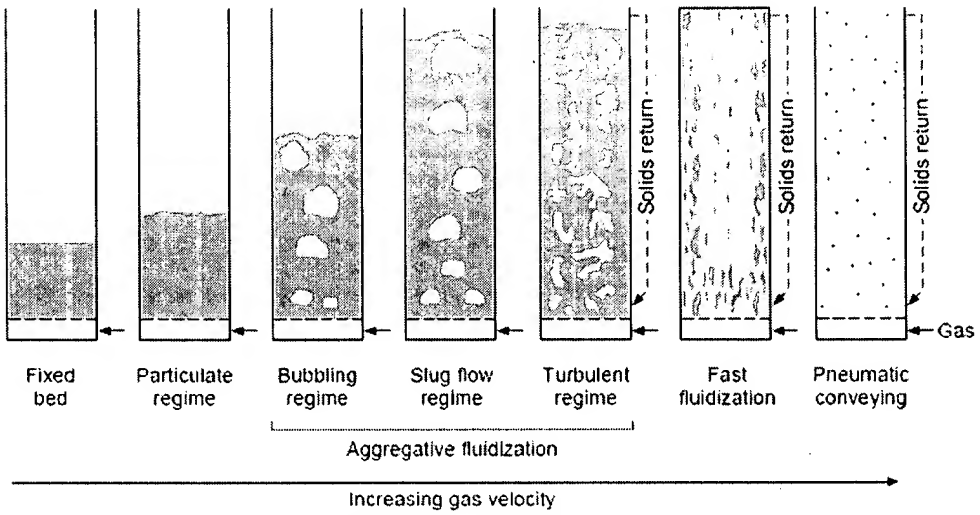


FIG. 17-4 Fluidization regimes. [*Adapted from Grace*, Can J. Chem. Eng., 61, 353–363 (1983).]

Furthermore, as stated in MPEP 2114, the manner of operating a device does not differentiate the device from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (The preamble of claim 1 recited that the apparatus was "for mixing flowing developer material" and the body of the claim recited "means for mixing ..., said mixing means being stationary and completely submerged in the developer material". The claim was rejected over a reference which taught all the structural limitations of the claim for the intended use of mixing flowing developer. However, the mixer was only partially submerged in the developer material. The Board held that the amount of submersion is immaterial to the structure of the mixer and thus the claim was properly rejected.)

Also, expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim, *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969), and the inclusion of a material or article worked upon by a structure being claimed does not impart patentability to the claims. *In re Young*, 75 F.2d 966, 25 USPQ 69 (CCPA 1935); *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963).

Regarding item (2), Applicant (at page 6, fourth paragraph) argues,

> "Owen teaches in Figure 1 a primary cyclone 65 and a secondary cyclone 67 wherein the leg of the secondary cyclone and the leg of the primary cyclone form a single primary and secondary cyclone leg complex. However, in the Owen structure, the dip leg of the primary cyclone is inclined, not straight and vertical as required by applicant's claim 1, whereas the leg of the secondary cyclone is straight."

However, this argument is moot in view of the new grounds of rejection.

Regarding item (3), Applicant (beginning at page 7, third paragraph) argues,

> "...Jones does not teach the combination claimed devoid of movable sealing parts. Quite the contrary, Jones' invention specifically provides for a mechanical closure on a dip leg that is selectively released and, thus, expressly teaches a movable sealing part.
>
> The Examiner asserts that Jones' sealing plate is only present when catalyst is introduced and is only temporary and will be removed during operation by the presence of a weight to pull a metal plate out of position or by forming the sealing means from a material that will partly or wholly fuse or rupture or disintegrate. However, the Examiner has by this admission acknowledged that Jones does teach a mechanical sealing part for the distal end of his dip leg and does teach that at least a part of the mechanical closure is movable. As such, Jones does not anticipate a distal termination that is devoid of movable sealing parts. Jones invention expressly provides for a mechanical closure placed on the dip leg."

The Examiner respectfully disagrees. Jones discloses that *during the state of final and intended operation*, the lower end of the dipleg is completely open to permit the return of catalyst from the cyclones to the fluid bed (e.g., being that the sealing means has disintegrated or has been completely removed upon reaching the operating temperature; see column 2, lines 24-55). Thus, *during the state of final and intended operation*, the dipleg is completely devoid of movable sealing parts, and as such, the radius-curved termination of Jones structurally meets the claims.

Furthermore, Jones specifically distinguishes his invention from the undesirable, mechanical-type or movable sealing parts being argued by Applicants. In particular, Jones states in column 2, lines 9-18,

> "Although dampers, operated by distant control from outside the vessel, have been used to close the dip-legs during the filling operation, the controls have a tendency to jam, the control rods require packing glands in the vessel walls, and the dampers even when open react and undesirable restriction to the normal flow of solids in the dip-legs under operating condition."

Applicant (beginning on page 8, second paragraph) further argues,

> "Even if Jones is considered to teach a radius curved termination that is devoid of movable sealing parts, Jones does not teach or suggest such a termination for a common dip leg of multiple cyclones, much less for a separator leg joining a leg of a secondary cyclone and a primary cyclone.
>
> It is further respectfully submitted that Owen clearly and irrefutably teaches sealing means at the end of his common dip leg. Since Jones does not teach or suggest that the sealing means can be omitted or eliminated from such a common dip leg, it is respectfully submitted that the skilled artisan would not obviously replace the sealing means of Owen with a radius termination as in Jones. Only applicant teaches that a radius termination devoid of movable parts may be incorporated at the termination of a common dip leg from different cyclone stages."

The Examiner respectfully disagrees. The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

In the instant case, it would have been obvious for one of ordinary skill in the art at the time the invention was made to replace the dipleg sealing means in the apparatus of Owen et al. with the radius termination as taught by Jones, on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because the radius termination would have acted as a baffle against bubbles of air rising through the catalyst bed, and the radius termination is an improvement over conventional mechanical-type or movable sealing parts, such as trickle valves, since "[a]lthough dampers, operated by distant control from outside the vessel, have been used to close the dip-legs during the filling operation, the controls have a tendency to jam, the control rods require packing glands in the vessel walls, and the dampers even when open react and undesirable restriction to the normal flow of solids in the dip-legs under operating condition." (see Jones: column 2, lines 9-18 and column 4, lines 36-39).

Where the combination of old elements performed a useful function, but it added nothing to the nature and quality of the subject matter already patented, the patent failed under §103. When a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious. Also, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same

way, using the technique is obvious unless its actual application is beyond his or her skill. One must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. *KSR International Co. v. Teleflex Inc.*, 550 U.S. --, 82 USPQ2d 1385 (2007).

Applicant (at page 6, last paragraph) further argues,

> "Owen's application is applicable to Positive Cyclones Systems, as depicted by its picture, where the primary cyclone (65) inlet is connected to a rise (51). Therefore, the fluidized bed vessel (73) pressure is lower than pressures at the cyclones dip legs from the primary and secondary cyclones. Applicant's invention is adapted to Negative Cyclones Systems, because the primary cyclone (21) inlet is at the same pressure as the fluidized bed vessel. Therefore, the pressures at the top of the cyclones' dip legs are lower than those at the fluidized bed vessel (31)..."

The Examiner respectfully disagrees.

Applicant's argument is not commensurate with the scope of the claims, since the features upon which Applicant relies (i.e., some sort of structural configuration that causes the cyclones to comprise a negative cyclone system, versus a positive cyclone system) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In addition, it appears that Applicant is arguing that their cyclone system differs from that of Owen et al., because their cyclone system is not connected to a "rise". However, it is unclear as to where this is specifically stated in Applicant's disclosure. For instance, Applicant's invention, as shown in FIGURE 2, is an improvement over the dipleg configuration of the prior art, as shown in FIGURE 1. The prior art configuration comprises a primary cyclone (3), a

secondary cyclone (4) and a rise (1). Although a rise is not shown in FIGURE 2, Applicant's disclosure would suggest to one of ordinary skill in the art that the system shown in FIGURE 2 is to be applied to the prior art system of FIGURE 1, which does include a rise in connection with the cyclone system.

Applicant (beginning at the last line on page 10) further argues,

> "... The Examiner's further reliance on Danielsen does not overcome the deficiencies of Owen in view of Jones noted above. In fact, Danielsen also teaches away from the invention by providing a movable sealing part at the distal end of the leg structure."

The Examiner respectfully disagrees. The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case, Danielsen et al. was merely relied upon for its teaching of the claimed ratio of radius/diameter for the radius curve (see column 3, lines 2-10; FIG. 1-2).

Applicant (beginning at the bottom of page 6) further argues,

> "Regarding claim 6, the Examiner's suggestion that Owen is "silent" as to the vertical distance between the junction and the discharge end is not well taken. The performance of the apparatus of applicant's invention depends on the distance between the junction point and the distal end of cyclone leg termination, plus it requires that the junction point be also immersed in the fluid bed (see Figure 2 and claim 1). The following situations can occur:
>
> a) if this distance is too short, the efficiency of primary cyclone is not affected, but the efficiency of secondary cyclone is affected in such a manner that the whole

system fails, and catalyst is thrown up into the environment; this happens because a minimum distance is needed below the junction in order that gas does not flow from the fluidized bed into the secondary cyclone dip leg, due to low pressure at the top of this dip leg, and also due to the fact that it is slanted relative to vertical. Even if a long radius curve is used, catalyst fluidizes in the initial stretch of the unique leg and if the junction is in this region, gas will flow towards the secondary cyclone dip leg causing collection efficiency to be reduced.

b) if this distance is too large- and this means that the length from the primary cyclone 21 bottom to the junction is accordingly too small- the junction may be located in a region where the catalyst flow still shows the presence of not a regular amount but a large amount of gas carried from the primary cyclone [a thing which is not widely known], while a catalyst is flowing along the dip leg, the catalyst releases a large proportion of the entrained gas which returns to primary cyclone without effecting the collection efficiency. The catalyst flow changes if regime from a fluidized bed flow to a dense bed flow. The junction has to be installed in the dense bed flow region, lest instead of the excess entrained gas returning to the primary cyclone dip leg, the same must flow towards the junction and towards the secondary cyclone dip leg. This will drastically reduce the collection efficiency of the cyclone system, even to efficiencies smaller than those using a single cyclone leg;

c) if this distance is large and the fluidized bed catalyst level is much below the junction, it may possibly happen that the sealing of the junction point will fail (the presence of catalyst level above the junction point will not be accomplished), and an undesired secondary gas (mainly) and catalyst stream will arise from the primary cyclone dip leg towards the secondary cyclone dip leg. The efficiency will fall to unacceptable levels, even worse then using a single state cyclone;

d) if restriction in the leg termination is not adequate, the invention will not function due to lack of catalyst mass for flowing (without restriction) or due to lack of flow (too restrictive).

The invention operates based on the pressure balance among the "communicating vessels", which comprise the fluidized bed, cyclones legs, junction point of the legs, and

considering head loss of primary and secondary cyclones, catalyst level in the catalyst bed in relation to the junction point, and also, the type of leg termination.

In summary, Owen is not just silent as to the vertical distance between the junction and the discharge end, but provides no teaching or suggestion whatsoever in this regard. Even if Jones' removable closure plate and curved tip were applied to dip leg 41, neither Owen nor Jones provides any teaching whatsoever as to the position of the junction of the legs relative to the radiused/curved termination. Thus, it is submitted that claim 6 is patentable over Owen and Jones."

The Examiner respectfully disagrees. It is generally recognized in the art that cyclone diplegs must be of an adequate length to allow for a sufficient accumulation of catalyst in the diplegs, and thus prevent the under-flow of vapors from the cyclone separators back into to the lower portion of the reactor vessel (see Jahnke et al.; column 2, lines 6-19). Accordingly, one of ordinary skill in the art at the time the invention was made would have routinely optimized the length of the separator leg, between the junction and the distal end, to provide an adequate length for allowing a sufficient accumulation of catalyst within the leg for preventing the underflow of vapors, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Furthermore, regarding item b), Applicant's argument that a vertical distance between the junction and the distal end that is too large *necessarily dictates* that the distance from the primary cyclone bottom to the junction will be too small is not found persuasive. In particular, the two variables are not linked: lengthening one distance does not cause a shortening of the other, and vice versa. Applicant's argument is based on the improper assumption that the total dipleg length remains fixed.

Applicant (beginning at page 11, third paragraph) further argues,

> "... The Examiner's further reliance on Luckenbach does not overcome the deficiencies of Owen and Jones noted above. In fact, Luckenbach also teaches away from the claimed invention because Luckenbach discloses movable sealing parts in direct contradiction to the combination claimed in applicant's claim 1 and the claims dependent therefrom.
>
> It is further respectfully submitted that Lukenbach does not teach or suggest that the radius curved portion of Owen/Jones could or should be formed from a plurality of straight pipe sections. In the case of Lukenbach, a single pipe part 14 is provided at an incline. Lukenbach does not teach that his inclined part is formed from a series of straight pipe sections; only a single pipe section is shown forming this component. Likewise, Lukenbach provides no teaching or suggestion whatsoever regarding using straight pipe sections to form a radius curve. In fact, if Lukenbach's teachings were followed in Owen/Jones, then Owen/Jones would provide a single straight segment at an incline as depicted in Lukenbach, rather than the single curved pipe."

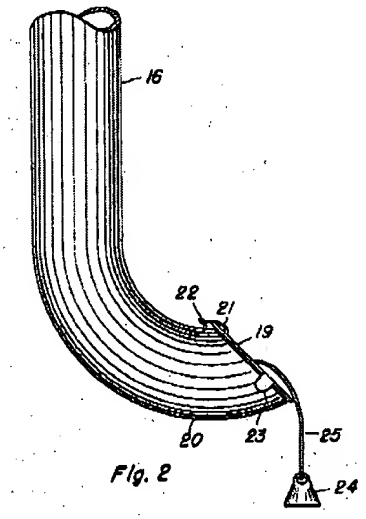
The Examiner respectfully disagrees. The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Please note that the Luckenbach et al. reference was merely relied upon to illustrate the conventionality of constructing an angular termination from a succession of straight pipe segment. Luckenbach et al., however, was not relied upon to teach a specific angle for the radius-curved termination.

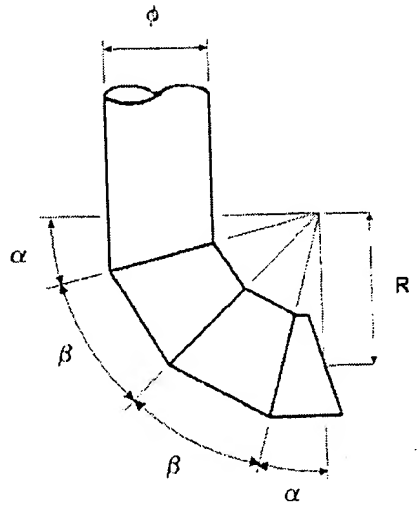
Applicant (beginning at page 12, first paragraph) further argues,

> "It is further respectfully noted that claim 5 provides that the succession of

straight tube sections directs the mass flow against phase particles into a plane orthogonal to the ascending gas flow. This is not true of Jones as Jones clearly directs mass flow at an acute angle to and in the same direction as the gas flow, as understood from Figure 2. Thus, Jones does not teach or suggest a curve directing mass flow in a plane orthogonal to the gas flow direction. Lukenbach also fails to teach or suggest directing flow in a direction orthogonal to the gas flow because Lukenbach teaches mass flow directed downwardly at an acute angle to and in the opposite direction from the gas flow."

The Examiner respectfully disagrees. It is unclear as to how the radius-curved termination as taught by Jones would differ in function from the radius-curved termination as claimed by Applicants because it appears that the angle of both terminations is essentially the same (note the attached figures below).





JONES' radius-curved termination **APPLICANTS' radius-curved termination**

Hence, both the radius-curved terminations of Jones and of Applicants should inherently function similarly or identically, by directing a descending mass flow of dense phase solids into a plane orthogonal to an ascending gaseous flow.

With respect to Applicant's comments on Luckenbach et al., please note that the Luckenbach et al. reference was merely relied upon to illustrate the conventionality of constructing an angular termination from a succession of straight pipe segment. Luckenbach et al., however, was not relied upon to teach a specific angle for the radius-curved termination.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 9:30 am - 5:30 pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Jennifer A. Leung
October 24, 2007